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* CALENDAR *

OF THE

School of Mining and Agriculture

KINGSTON, ONTARIO.

* FOURTH SESSION, *

1896-'97.

KINGSTON :

PRINTED AT THE BRITISH WHIG OFFICE.

1896.

All communications to be addressed
to WILLIAM MASON, Bursar, Kingston,
Ont.

SCHOOL OF MINING
AND
AGRICULTURE.

CALENDAR 1896-7.

- Part I.....School of Mining.
 - Part II.....Dairy School.
 - Part III.....Veterinary School.
- Appendix.—Reports.

1856/7

VISITOR.

His Honour GEORGE A. KIRKPATRICK, D.C.L., LL.D., &c.,
Lieutenant-Governor of Ontario.

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Vice-Chairman.....JOHN MCKELVEY, Esq.

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JOSEPH B. WALKEM, Esq.....} Appointed by the City Council.
THE WARDEN OF THE COUNTY OF FRONTENAC.

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ADVISORY COMMITTEE.

The President of the Eastern Ontario Dairymen's Association.
LT.-COL. DRURY. W. B. DALTON, Esq.
J. CARSON, Esq. D. M. MACPHERSON, Esq., Lancaster.
J. L. HAYCOCK, M.P.P.

PART I.

... SCHOOL OF MINING ...



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SCHOOL OF MINING.

CALENDAR.

1896.

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|-----------|--|
| July | 7—Summer School of Science opens. |
| August | 4—Summer School closes. |
| September | 1—Field Class in Geology and Prospecting sets out
on a three weeks' tour. |
| " | 17—Supplemental Examinations begin. |
| October | 1—Classes in Mining open. (1st term.) |
| " | 16—Holiday. |
| December | 23—Christmas Holidays begin. |

1897.

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|---------|---|
| January | 6—Classes re-open. (2nd term.) |
| " | 6—Prospectors' Course begins. |
| March | 3—Holiday. |
| " | 4—Prospectors' Course ends. |
| April | 9—Class work closes. |
| " | 10—Examinations begin. |
| | 28—Convocation, for distributing prizes, announcing
honours, and laurateating graduates. |

FACULTY.

W.M. L. GOODWIN, B.Sc. (LOND.), D.Sc. (EDIN.), F.R.S.C.,
DIRECTOR and Professor of Chemistry.

WILLIAM NICOL, M.A.,
Professor of Mineralogy, Metallurgy and Assaying.

WILLET G. MILLER, B.A.,
Lecturer on Geology and Petrography.

W.M. HAMILTON MERRITT, M.E., F.G.S., Associate Royal School
of Mines, England,
Lecturer on Mining Engineering, The
Economic Geology of Ontario, and The
Discovery and Winning of Minerals.

R. CARR HARRIS, C.E.,
Professor of Engineering.

WILLIAM MASON,
Lecturer on Freehand, Mechanical and Office
Drawing, Topography and Surveying.

N. F. DUPUIS, M.A., F.R.S.C.,
Lecturer on Mechanism.

JOSEPH BAWDEN, Barrister-at-Law,
Lecturer on the Law of Mines.

R. W. BROCK, M.A.,
F. J. POPE, M.A.,
DR. ISAAC WOOD, M.A., }
Laboratory Demonstrators.

WILLIAM MASON, Bursar.

ALFRED DEAN, Janitor.

ANNOUNCEMENT.

The SCHOOL OF MINING is a branch of the *School of Mining and Agriculture*, incorporated by Act of the Legislature of Ontario.

The objects of the School of Mining are to give a thorough scientific education, both theoretical and practical, to men studying for the professions of the mining engineer, the assayer, the consulting geologist, and the metallurgist; and to provide for prospectors, mine foremen and others interested in the discovery and winning of minerals, such instruction as shall make their occupations more interesting and less liable to failure. With these ends in view the Board of Governors placed the School near Queen's University so as to take advantage of the instruction therein provided in English, mathematics, physics, and the biological sciences. Kingston was chosen also as the most suitable town within easy reach of the extensive mineral regions of Eastern and Northern Ontario. Recognizing the fact that the mineral lands of Ontario require careful exploration and development, in order to lead to safe and economical mining, the governors of the school have developed the chemical, mineralogical, geological and assay departments as rapidly as possible, and have built and equipped a mining laboratory for the practical study of milling, concentrating, etc. They have also organized short practical courses in mining centres, so as to some extent to carry the opportunities afforded by the school to those whose business prevents them from attending it.

The School of Mining is open to all who wish by earnest study to enlarge their knowledge of minerals and mines, or to pursue science for its own sake. The atmosphere of the school is suitable only for those who are fond of steady work.

REQUIREMENTS FOR ADMISSION.

REGISTRATION.—All students are required to register and pay the registration fee at the beginning of each session.

MATRICULATION.—Before being admitted to examination on the work of the course, candidates for a degree must pass the matriculation examination, or otherwise satisfy the Faculty of their fitness to proceed with their course. Matriculation consists of the Junior Leaving examination for Ontario in the subjects of English and Mathematics. The details of this examination may be found in the calendars of Ontario Universities or in the Regulations of the Education Department. Other examinations will be accepted so far as they are equivalent. Candidates who have made at least fifty per cent. on the papers in any of the Senior Leaving examination subjects are not required to take the junior classes in those subjects.

Students who have already taken, in a University Arts or Science Faculty or in a recognised technical school, subjects included in a degree course in the School of Mining, will be admitted to the year for which they are qualified, on entering upon a course for the degree of M.E. or B.Sc.

The B.Sc. course can be completed in one year after graduation in an honour course in chemistry, mineralogy and geology.

SPECIAL STUDENTS.—Unmatriculated students may take any classes and examinations for which they are prepared. The work in Chemistry, Mineralogy, Geology, Drawing, Surveying, etc., is so arranged that those who wish to study these subjects, either for their scientific interest or as leading to professions other than mining engineering, may profitably pursue their studies here.

The practical work in assaying, mineralogy, milling, and mining is of such a nature that those who wish to prepare themselves for any special department of work connected with mining and milling may profitably spend a session or two at the school. A two years' course

might include junior chemistry, blowpipe analysis, qualitative analysis, systematic mineralogy, and geology, the first year; and chemistry of metals, assaying, descriptive and determinative mineralogy, mining, milling, ore dressing, and ore deposits the second year.

Special short courses for prospectors and others are conducted during the session. (See p. 36.)

EXTRAMURAL STUDENTS.—Students who are not able to attend the school may register in the classes of junior and senior chemistry, elementary mineralogy, and geology. Tutors are appointed to assist them by correspondence.

FEES.—Registration and Class fees must be paid annually on or before October 16, and Laboratory fees before students begin work in the laboratories.

Registration.....\$ 1 00

FEES FOR A COURSE IN MINING, &c.—*These fees cover all class and laboratory fees for the course.*

First Year.....	\$ 40 00
Second Year.....	45 00
Third Year.....	50 00
Fourth Year.....	55 00

FEES FOR SINGLE CLASSES, &c.

Junior and Senior Chemistry each	\$ 12 00
Any other Course of Lectures.....	8 00
Drawing	9 00
Surveying, per Session.....	5 00
Use of Assaying Laboratory for Session.....	5 00
" Chemical Laboratory for Session.....	20 00
" Petrographical Laboratory for Session.....	5 00
Analytical Chemistry (Medical).....	12 00
Specialists' Practical Course in Qualitative Analysis, Blowpiping and Mineralogy.....	10 00
Elementary Mineralogy and Blowpiping.....	5 00
Graduation Fee.....	20 00
Annual Examination Fee.....	3 00
Tutor's Fee (Extramural Students), one subject..	5 00
" " " more than	
one subject.....	10 00

COURSES OF STUDY.

The following courses are offered :

I. Three years' courses for a diploma in

- (A.) Mining Engineering.
- (B.) Analytical Chemistry and Assaying.

II. Four years' courses for a degree in

- (A.) Mining Engineering (M.E.)
- (B.) Chemistry and Mineralogy (B.Sc.)
- (C.) Mineralogy and Geology (B.Sc.)

III. Post-graduate courses for the degree of Doctor of Science (D.Sc.) (For further information see the calendar of Queen's University.)

I.—THREE YEARS' COURSES.

These courses are intended to fit men to enter upon the practice of mining engineering and assaying. The scientific groundwork of these professions is included as completely as the length of the course will permit; and much time is given to those practical studies which best equip the student for the work of exploration, developing, supervision, construction, etc., connected with mining. The courses are so arranged that, upon completing them, students may, if they wish, by another year's study, complete the course for a degree.

The arrangement into years is not compulsory, but students are advised to follow it as closely as circumstances will permit.

A.—MINING ENGINEERING.

FIRST YEAR.

First Term.

Algebra and Geometry,
Junior English,
Junior Physics,
Junior Chemistry,
Drawing,
Blowpipe Analysis,
Surveying.

Second Term.

Algebra and Geometry,
Plane Trigonometry,
Junior English,
Junior Physics,
Junior Chemistry,
Drawing,
Blowpipe Analysis,
Qualitative Analysis.

SECOND YEAR.

First Term.

Higher Algebra,
Solid Geometry,
Senior Physics,
Chemistry of Metals,
Elementary Crystallography,
Qualitative Analysis,
Systematic Mineralogy,
Geology,
Drawing and Designing.
Shop Work,
Surveying.

Second Term.

Higher Algebra,
Solid Geometry,
Spherical Trigonometry,
Senior Physics,
Quantitative Analysis,
Systematic Mineralogy,
Geology,
Drawing and Designing,
Shop Work.

THIRD YEAR.

First Term.

Co-ordinate Geometry,
Elementary Differential and
Integral Calculus.
Descriptive Mineralogy,
Determinative Mineralogy,
Geology and Petrography,
Assaying,
Mining,
Ore Dressing,
Surveying,
Civil Engineering,
Shop Work.

Second Term.

Co-ordinate Geometry,
Elementary Differential and
Integral Calculus,
Optics,
Descriptive Astronomy,
Technical Chemistry,
Descriptive Mineralogy,
Determinative Mineralogy,
Geology and Petrography,
Assaying,
Ore Deposits,
Mining,
Ore Dressing,
Milling.

B.—ANALYTICAL CHEMISTRY AND ASSAYING.

FIRST YEAR.

First Term.

Algebra and Geometry,
Junior English,
Junior Physics,
Junior Chemistry,
Drawing,
Blowpipe Analysis,
Surveying.

Second Term.

Algebra and Geometry,
Junior English,
Junior Physics,
Junior Chemistry,
Qualitative Analysis,
Drawing,
Blowpipe Analysis.

SECOND YEAR.

First Term.

Solid Geometry,
Adv. Algebra and Pl. Trig.
Chemistry of Metals,
Elementary Christallography,
Qualitative Analysis,
Systematic Mineralogy.

Second Term.

Adv. Algebra and Pl. Trig.
Chemical Physics,
Qualitative Analysis,
Systematic Mineralogy.

THIRD YEAR.

First Term.

Organic Chemistry,
Crystallography,
Descrip. and Det. Mineralogy,
Geology and Petrography,
Quantitative Analysis,
Assaying,
Metallurgy.

Second Term.

General Chemistry,
Technical Chemistry,
Descrip. and Det. Mineralogy,
Geology and Petrography,
Quantitative Analysis,
Assaying,
Metallurgy,
Ore Deposits.

II.—FOUR YEARS' COURSES.

These courses are arranged so as to give the extended scientific training required for the more highly specialized fields of professional work in mining, assaying, analytical chemistry, mineralogy and geology. Courses A and B may be completed in one year after completing the corresponding three years' course. Course C affords a general education in natural science with special training in mineralogical and geological work and studies. It is intended for those who have in view the profession of consulting geologist or the work of geological surveys.

A.—MINING ENGINEERING.

The first three years of this course are the same as for the Three Years' Course. (See page 9.)

FOURTH YEAR.

First Term.

Quantitative Analysis,
Assaying,
Metallurgy,
Economic Geology,
Mechanism,
Surveying,
Materials and Construction,
Mining Engineering,
Milling,
Mining Law.

Second Term.

Quantitative Analysis,
Assaying,
Metallurgy,
Economic Geology,
Mechanism,
Surveying,
Materials and Construction,
Mining Engineering,
Milling,
Mining Law.

B.—CHEMISTRY AND MINERALOGY.

The first three years of this course are the same as for the Three Years' Course. (See p. 10.)

FOURTH YEAR.

Special work along lines to be chosen by the candidate; an original research in Chemistry or Mineralogy.

C.—MINERALOGY AND GEOLOGY.

FIRST YEAR.

First Term.

Algebra and Geometry,
Junior English,
Junior Physics,
Junior Chemistry,
Drawing,
Blowpipe Analysis,
Animal Biology.

Second Term.

Algebra and Geometry,
Junior English,
Descriptive Astronomy,
Junior Physics,
Junior Chemistry,
Drawing,
Blowpipe Analysis,
Botany.

SECOND YEAR.

First Term.

Solid Geometry,
Plane Trigonometry,
Chemistry of Metals,
Elementary Crystallography,
Qualitative Analysis,
Systematic Mineralogy,
Geology,
Surveying.

Second Term.

Chemical Physics,
Plane Trigonometry,
Qualitative Analysis,
Systematic Mineralogy,
Geology.

THIRD YEAR.

First Term.

分析,
定名和鉴定的矿物学,
地质学和岩石学,
地形学测量,
野外地质学。

Second Term.

球形三角学,
分析,
简单定量分析,
定名和鉴定的矿物学,
地质学和岩石学,
地质图和断层。

FOURTH YEAR.

岩石学,
经济地质学。

岩石学,
经济地质学。

Special work along lines to be chosen by the candidate ; an original research in Mineralogy or Geology.

SUBJECTS OF STUDY.

CHEMISTRY.

Professor: William L. Goodwin, D.Sc., Edin.

Demonstrators: R. W. Brock, M.A., F. J. Pope, M.A., and I. Wood, M.A., M.D.

JUNIOR.

1. *Lectures* on the principles of Chemistry as follows:

Chemical Species—Crystals and Crystallisation—Chemical Change—Laws of Combination—Relation of Heat to Chemical Changes—Notation—Equations—Nomenclature—Volume Relations of Gases in Chemical Change—Volume Formulas—The Atomic Theory—Descriptive Chemistry of the Non-metallic Elements and their Compounds—Electrolysis—Spectrum Analysis.

Books—Goodwin's Chemistry (Henderson & Co., Kingston.) Remsen's Inorganic Chemistry (Advanced Course). Mondays and Tuesdays at 11 a.m.

2. *Laboratory practice*, consisting of simple experiments, by means of which the student may become acquainted with the properties of common substances. Wednesdays or Thursdays at 11 a.m.

3. *Qualitative Analysis* is begun in the second term.

SENIOR.

(**1st TERM**). 1. *Lectures* on the chemistry of the metals, their occurrence in nature, reduction, and uses. Thursdays and Fridays at 11 a.m.

2. A course of ten lectures on *Elementary Crystallography*. Mondays, Tuesdays, Wednesdays, Thursdays and Fridays at 8 p.m.

3. *Qualitative Analysis* is continued. Notes on systematic qualitative analysis are given in a course of fifteen lectures by Professor Nicol in October.

(**2nd TERM**). 1. *Lectures* on chemical laws and theories. Thursdays and Fridays at 11 a.m.

2. *Qualitative Analysis of Minerals and Simple Quantitative Analysis*. This work will occupy from two to four hours a day. The greater part of the time is spent in the laboratories. *Lectures* on quantitative analysis on Thursdays at 3 p.m.

- Books*—Dobbin & Walker's Chemical Theory (Macmillan & Co.)
Goodwin's Chemistry and Supplement (Henderson & Co.)
Ritcher's Inorganic Chemistry (P. Blakiston, Son & Co.)
Williams' Crystallography (Henry Holt & Co.)
Thorpe & Muir's Qualitative Analysis (Longmans, Green and Co.)
Bolton's Quantitative Analysis.

THIRD YEAR.

(**1st TERM**). 1. *Lectures and Class Work on Organic Chemistry.* The student is expected to master the contents of Remsen's Organic Chemistry.

Wednesdays at 3 p.m.

2. *Advanced Crystallography* studied in its relations to chemistry and mineralogy. The student has access to collections of wooden and wire models and mounted crystals.

Mondays, Tuesdays and Thursdays, at 3 p.m.

3. *Quantitative Analysis* is continued throughout the third year by students taking the courses in Chemistry and Assaying, or Chemistry and Mineralogy. Special attention is given to the quantitative analysis of minerals.

Text-book—Fresenius' Quantitative Analysis.

(**2nd TERM**). 1. *Lectures on selected subjects in Technical Chemistry.* For the session of 1896-1897 the subjects will be *Fuels, Ores and Fluxes.*

Mondays at 3 p.m.

2. *Lectures on General Chemistry.* For the session of 1896-1897 the subjects will be Thermochemistry, Electrochemistry, and Kinetic Theory of Gases.

Text-book—Ostwald's Outlines of General Chemistry.

Wednesdays at 3 p.m.

3. *Quantitative Analysis.*

FOURTH YEAR.

The work for the fourth year consists entirely of laboratory work in quantitative analysis. Students taking the M.E. course extend their acquaintance with analysis of minerals, slags, etc. Those taking the B.Sc. course in chemistry and mineralogy will, in addition, carry on experimental work in some selected field such as rock analysis, organic analysis, analysis of water, air, foods, fertilizers, soils, etc.

All students are urged to make daily use of the library, reading along the lines of their laboratory work.

THE CHEMICAL LABORATORIES.

The practical work in Chemistry is carried on in three laboratories: No. 1 for qualitative analysis, No. 2 for quantitative analysis, and No. 3 for experimentation in class, and drill on the subjects treated of in the junior lectures. No. 1 and No. 2 are fitted up with 62 and 42 respectively locked work places, so that 104 students can be provided each with a set of apparatus under lock and key. These laboratories are open from 8 a.m. to 5 p.m., and students are allowed to carry on their analytical work when not otherwise engaged. The number of hours a day to be spent in the laboratories depends, to some extent, on the aptitude of the student for experimentation. The average is about two and a half hours. No. 3 serves both as a laboratory and a class room. It is fitted up with seats and desks which are at the same time work tables. Besides these larger laboratories there are smaller rooms devoted to special branches of analytical chemistry and to research.

Each student, before entering any practical class in chemistry, is required to deposit five dollars with the Bursar. On presenting to the instructor of the class the receipt for this and the class ticket, the student receives the key of his place. The deposit is returned at the end of the session, breakages, etc., having been deducted.

ASSAYING.

Professor: William Nicol, M.A.

The work of the Assaying Class is carried on partly in the assaying laboratory and partly in the quantitative chemical laboratory, as assaying is a branch of quantitative analysis. The Assay laboratory is equipped for conducting fire assays of the metallic ores. As assaying forms an important part of milling, the crusher and sample grinder of the mining laboratory are employed for preparing larger samples for assay. Smaller samples are

prepared by hand, using mortars, the "buck-board," sieves, etc. A balance room adjoins the assay laboratory and is supplied with pulp balances for weighing in the ore. The assay laboratory is furnished with one large muffle furnace for soft coal, four portable coke furnaces (Brown pattern), one portable charcoal furnace, a set of portable gasoline furnaces, one gas muffle furnace, one gas crucible furnace, one combined muffle and crucible gas blast furnace, and three wind crucible furnaces for hard coal. The object is to prepare students for working with the different kinds of fuel. The laboratory is well supplied with ore-bins and samples of pulverized ore, so that practice may be had with a variety of ores. The work begins with an assay of coal to ascertain its commercial value. A thorough course in the analysis of iron ores by wet methods is given. The work is carried on, as far as possible, on the plan of Professor Ledebur, of Freiberg. Blair's "Analysis of Iron" is used as a text-book, supplemented by lectures delivered early in the session. The assays of copper, nickel, lead and zinc are made partly by the dry method, partly by electrolysis, and partly by titration.

Text-books—Chapman's Assay Notes, (Copp-Clark Co.)

Brown's Manual of Assaying, 5th ed. (Sargent & Co., Chicago.)

Blair's Chemical Analysis of Iron, 2nd ed. (Lippincott Co.)

Lord's Notes on Metallurgical Analysis.

Books for reference:

Beringer's Text-book of Assaying (C. Griffin & Co.)

Bodemann & Kerl's Assaying.

Furman's Manual of Assaying (Wiley & Sons.)

METALLURGY.

Professor: William Nicol, M.A.

Lectures on ores, furnaces, fuels, and fluxes; the metallurgy of iron, steel, nickel, silver, gold, copper, lead, and aluminum.

Text-book—Roberts-Austen's Metallurgy.

MINERALOGY.

Professor: William Nicol, M.A.

The course in Mineralogy extends over three years. The work of the first-year class is intended as a preparation for those entering upon the studies of geology, petrography, and metallurgy. The class should be taken along with the classes of junior chemistry and junior physics, as a knowledge of chemistry and physics is necessary for a proper comprehension of the subject. The work consists of lectures on the physical, optical, and other properties of minerals, the description of forty or fifty prominent Canadian minerals, followed by practical work in the determination of these. The lectures are illustrated by specimens from the lecture-cabinet, which is furnished with collections, to illustrate the physical, optical, and other properties of minerals. The practical work of the class is conducted in the mineralogical and blowpipe laboratory, where cabinets containing specimens of commonly occurring minerals are provided. The students are taught to recognize minerals by simple field tests, such as color, form, hardness, specific gravity, etc. For this work students must provide themselves with a knife, a magnet, a pocket lens, and a streak plate.

The practical work in mineralogy is supplemented by practical instruction in the use of the blowpipe, which is of so much importance in studying the chemical properties of minerals, and also as an aid to qualitative analysis. The blowpipe laboratory is furnished with the necessary apparatus for twenty-four students.

The work of the second year class is an extension of that of the first year, and is intended to prepare students for undertaking descriptive and determinative mineralogy in the third year, and as an aid in the study of petrography. More attention is given in this class to the study of the physical, optical, thermal, electrical, and other properties of minerals. Specimens, models, thin sections, charts, and lantern slides are used to illustrate the lectures. For determining the specific gravity of minerals, a specific gravity balance, a Jolly's spiral balance, and a Nicholson's areometer, are provided for use by students.

The work of this class—systematic mineralogy—is supplemented by a practical class in crystallography (for details see under *Chemistry*), and by practical and theoretical work in the qualitative analysis of minerals in the qualitative laboratory.

The work of the third year class consists of descriptive mineralogy, determinative mineralogy, the quantitative analysis of minerals, petrography and ore deposits. For the descriptive part the school collection of minerals is made use of. Dana's *System of Mineralogy* is used as a text-book in the class. The descriptions are read and comparisons are made with the specimens. The mineral specimens are constantly being increased by collection, donation and purchase, the aim being to make the museum as complete and representative as possible. Special attention is given to Canadian ores and gangue minerals, as this class aids very materially in the study of ore deposits. No attempt is made to get the minerals "by rote," the desire being rather to acquire a practical working knowledge of them, such as would be useful to the assayer, consulting geologist, or mining engineer.

The work in connection with determinative mineralogy is taken in two parts: (a) practical mineralogy and (b) determination by the blowpipe. For the first part cabinets filled with specimens of minerals are provided for use. Students are permitted to handle the specimens and test them by ordinary field tests, such as form, color, hardness, etc. The object of this class is to enable students to recognize minerals in the field. Frazer's *Tables for the Determination of Minerals* is used as a guide. For the second part, practical instruction is given in the blowpipe laboratory in the determination of minerals. The object of the class is to assist students in acquiring a knowledge of the chemical properties of minerals, and to enable them to test minerals in the field, or more leisurely at home. The advantage that this class affords to the prospector and field geologist is at once apparent.

Each student is supplied with certain pieces of blowpipe apparatus, for the care of which he is held responsible. As far as possible the work of this class is carried

on parallel with that in descriptive mineralogy, as the blowpipe characters form an important part in the description of every mineral.

For details of the work in quantitative analysis of minerals, see under *Chemistry*; and for details of the work in petrography and ore deposits, see under *Geology*.

First Year.

Blowpipe Analysis—(a) A course of practical demonstrations to illustrate and explain reactions in studying the chemical properties of minerals, (one hour per week). (b) A practical class in which the experiments seen in the lectures are performed by the students (one hour per week).

Text-books—Chapman's Blowpipe Practice, 2nd ed. (Copp-Clark Co.)

Dana's Minerals and How to Study Them.

Books for reference :

Cornwall's Translation of Plattner's Manual of Qualitative and Quantitative Analysis with the Blowpipe. 7th ed. (Van Nostrand Co.)

Endlich's Manual of Qualitative Blowpipe Analysis.

Moses & Parson's Mineralogy, Crystallography and Blowpipe Analysis.

Brush's Manual of Determinative Mineralogy and Blowpipe Analysis, 13th ed. (Wiley & Sons.)

Landauer's Blowpipe Analysis.

Students must supply their own blowpipe apparatus.

Second Year.

1. Systematic Mineralogy.

Text-book—Bauerman's Systematic Mineralogy. (Longmans, Green & Co.)

Books for reference—Naumann-Zirkel's *Mineralogie*.

Tschermak's *Mineralogie*.

Dana's Text-book of Mineralogy, 15th ed. 1889. (John Wiley & Sons.)

2. Crystallography.

Lectures and practical study of crystal forms by means of natural crystals, and wooden and wire models.

Williams' Crystallography. (Henry Holt & Co.)

3. Qualitative Analysis of minerals by blowpipe and wet reagents.

Lectures on Qualitative Analysis.

Text-book—Fresenius' Qualitative Analysis.

4. Essays on prescribed subjects.

Third Year.

1. Descriptive Mineralogy.

Tuesday and Friday at 9 A.M.

Description and classification of the commonly occurring minerals, special attention being given to Canadian Ores. Examination of specimens from cabinets.

Text-book—Dana's System of Mineralogy, 6th ed. (Wiley & Sons.)

Books for reference:

Chester's and English's Catalogues of Minerals.

Chapman's Minerals and Geology of Ontario and Quebec.
3rd ed. (Copp-Clark Co.)

Commissioners' Report on Mineral resources of Ontario,
1890.

Reports of Bureau of Mines, 1891-95.

2. Determinative Mineralogy.

Practical instruction in the determination of minerals
by means of the blowpipe and by field tests.

Text-books—Crosby's Tables for the Determination of Common Minerals.

Frazer's Tables for the Determination of Minerals,
3rd ed., 1891. (J. B. Lippincott & Co., Phila.)

Brush's Manual of Determinative Mineralogy and
Blowpipe Analysis, 13th ed. (Wiley & Sons.)

3. Quantitative Analysis of Minerals (selected samples).

Text-book—Fresenius' Quantitative Analysis.

4. Lectures on Quantitative Analysis.

GEOLOGY AND PETROGRAPHY.

Lecturer : Willet G. Miller, B.A.

The instruction in this department is adapted to the needs of the prospector, the mining engineer, and the professional geologist. Provision is also made for persons who desire a knowledge of the subject as part of a general education. Graduates and others who wish to pursue some special line of investigation, or to have the use of the laboratories and apparatus, in order to work up material collected by themselves, will have every facility placed at their disposal.

Students have access to the museum of Queen's University, which contains a large number of specimens illustrative of the geology of Canada, as well as to the collections of the school.

A course in field geology, lasting about three weeks, is given, during September in each year. Particulars concerning the course may be obtained from the Bursar.

Second Year.

GEOLOGY.

The object of this course is to give a general knowledge of the subject as an introduction to the work of the third and fourth years.

The following themes will be treated of in the lectures:—The planetary relations of the earth; the atmosphere; waters; solid crust; probable nature of the earth's interior; rocks, their general megascopic and microscopic characters and classification; volcanic action; earthquakes; upheaval; subsidence; geological effects produced by heat, air, water, and life; bosses; dykes; veins; stratification; dip; strike; anticline and syncline; faults; foliation; nature and uses of fossils; stratigraphical geology; outline of the geological history of the globe, etc.

The lectures are illustrated by means of maps, diagrams, and lantern views.

The laboratory work will consist of the examination of typical specimens of the different groups of fossil plants and animals, and of hand specimens of the more common rocks.

During the months of October and November excursions will be made to places of geological interest in the vicinity of Kingston.

Text-books and books for reference:

Le Conte's Compend of Geology.

Dana's Manual of Geology (last edition).

Chapman's Minerals and Geology of Ontario and Quebec.

Third Year.

GEOLOGY.

In this course special attention will be given to stratigraphical geology and the geology of Canada. Type fossils of the different formations will be studied.

Text-books and books for reference :

- Chapman's Minerals and Geology of Ontario and Quebec.
- Dawson's Geology of Canada.
- Dana's Manual of Geology.
- Wood's Elementary Palaeontology.
- Geological Survey Reports of Canada.

PETROGRAPHY.

This course will consist of lectures on the use of the petrographical microscope and accessories in the determination of the rock-forming minerals, together with the determination of some of the more common igneous rocks.

The lectures will be illustrated by means of microscopic projections of thin sections of minerals and rocks, and will be supplemented by a large amount of laboratory work.

A considerable variety of dyke rocks occurs in the Kingston district. These will be studied in the field, and specimens will be collected by each student for examination in the laboratory.

Boxes for holding slides, and material used in the preparation of thin sections may be obtained from the Bursar.

Text-books and books for reference :

- Rosenbusch-Iddings' Microscopical Physiography of Rock-Forming Minerals.
- Löewinson-Lessing's Tables for the Determination of the Rock-Forming Minerals.
- Hatch's Petrology.
- Harker's Petrology for Students.

ORE DEPOSITS.

Lectures on the origin, modes of occurrence and uses of metalliferous minerals, with mention of their chief localities. The characters by which ore bodies are sometimes indicated to the prospector will be described. A sketch will be given of the geology of some of the leading mining districts.

Text-books and books for reference :

Phillips' Ore Deposits.

Kemp's Ore Deposits of the United States.

Mineral Statistics, Geological Surveys of Canada and the United States.

Rothwell, The Mineral Industry. Vols. I, II and III.

Fourth Year.

GEOLOGY.

A study will be made of structural and dynamical geology in connection with their bearings on economic problems.

Opportunities will be offered for those wishing to prosecute any special line of investigation.

Students are advised to devote as much time as possible to field work during the preceding long vacation, and to collect material for study in the laboratory during the winter.

Text-books—Geikie's Text-Book of Geology.

Dana's Manual of Geology.

PETROGRAPHY.

A course of lectures will be given on the microscopic characters and classification of the igneous rocks, and on the characters, origin and classification of the pre-Cambrian formations.

Special attention will be paid to the metamorphic series of the Kingston district, as exceptional opportunities are here offered for the study of the field relations of these rocks, and for attacking those problems as to their origin, which are now attracting the attention of geologists.

The *petrographical laboratory* is supplied with electric power and provided with diamond saws and other apparatus needed in the preparation of thin sections of minerals and rocks for examination with the microscope.

Laboratory facilities are also provided for microchemical tests, and for the use of heavy solutions in separating the constituents of rocks.

The school owns several petrographical microscopes of the latest and most improved designs.

Text-books and books for reference :

Rosenbusch—*Die Massige Gesteine.*

Zirkel—*Lehrbuch der Petrographie.* Vols. I, II and III.

Levy and Lacroix—*Les Mineraux des Roches.*

Rosenbusch-Iddings—Microscopical Physiography of Rock-Forming Minerals.

Iddings—The Origin of Igneous Rocks.

Van Hise—Correlation Papers, Archæan and Algonkian.

ECONOMIC GEOLOGY.

Lectures on the origin, modes of occurrence and uses of the metals and their ores; materials used in the production of light and heat; minerals used in chemical manufactures; fertilizers; mineral pigments; salt, brine and mineral waters; building materials; cements; refractory materials; abrasive materials; gems and precious stones; miscellaneous.

MINING ENGINEERING AND ORE DRESSING.

Lecturer: Wm. Hamilton Merritt, F.G.S., A.R.S.M.

This course is given by lectures and text-book work, supplemented by models, drawings, photographs, the actual examination of mines, and practical work in milling, ore dressing, and sampling in the mining laboratory.

The lectures on the art of mining are designed to make the student familiar with the operations in vogue in this and other countries for finding, developing, extracting and mechanically treating minerals of economic value. It brings to a practical issue the information acquired by the lectures on mathematics, mechanics, surveying, and physics. A knowledge of chemistry and mineralogy is also necessary to give a satisfactory appreciation of the character of the ores searched for or extracted.

Connected with the mining of the ore, its geological association is considered.

This subject is covered by four courses.

The *first course* begins with the application of economic geology to the needs of the explorer or engineer, so that on the one hand he can intelligently search for, then develop a mineral deposit of economic value, and on the other hand he can study and value mining properties,

locate appropriately the necessary plant and calculate the cost of production. It includes the discussion of faults and the means of finding faulted bodies, with practical problems. The subjects of blasting, timbering, and winning deposits are applied to actual cases, as driving a drift, etc., and problems from practical data are solved by the students.

The *second course* covers the subjects of underground and surface haulage, winding, loading, unloading and stocking ores, drainage or pumping, ventilation, lighting, descent and ascent, principles of employment, hygiene and mining laws and accidents. Problems are given in each of these subjects to cover cases that meet the enquirer in ordinary practice.

The *third course* treats of the mechanical preparation of ores by the wet, dry, or magnetic methods.

The *fourth course* deals with the milling of gold and silver ores, and the sampling of ores considered especially in connection with practical work in the mining laboratory, where it is intended also to illustrate roasting, chlorination and smelting processes.

It is expected that students will familiarize themselves with mining operations during the vacation, and arrangements will also be made for summer classes in mining regions.

The course includes the following heads, illustrated in each case by examples of the most advanced methods wherever they may be carried on, but especial mention is made of typical work which is being carried on in Canada.

Occurrence or manner in which the useful minerals are formed in the earth's crust. Classification of mineral deposits. Beds, strata, or seams; mineral veins or lodes; masses and their formation. Examples of the various modes of occurrence of the most important useful minerals. Irregularities in beds and veins, faults or dislocations, and rules for searching for the lost portion of a deposit. Examination and survey of mineral properties, relation of topography to geological structure, construction of maps and sections, and tracing of probable outcrops as a guide to exploration.

Prospecting or search for mineral deposits. Discoveries by chance or by mistake. Aid afforded by geology. Surface indications by form or colour of the ground or scattered fragments of the deposit. Decomposed outcrops of beds or veins. Association of minerals. Magnetic surveys with dip compass. Simple field tests of common ores. Prospectors' kit. Qualification of the prospector. Prospecting by pits, trenching, costeaning or husking. Importance of thorough surface prospecting work illustrated by examples.

Boring. Use of bore holes. Methods of boring. Percussion boring. With rods, Canadian method; with rope, United States method. Free falling tools. Rotary boring. Earth augers. Diamond drills worked by hand or by machinery. Hydraulic boring.

Mine Development. Choice of methods, location of openings; opening of shafts, slopes, tunnels, or drifts; sinking of winzing, and driving of crosscuts, drifts and adits.

Excavation. Hand tools, machine tools, steam diggers and dredges, hydraulic, endless chain, scoop and clam shell. Conveyance of power to machinery placed below ground. Rotary and percussive rock worked by steam, water, compressed air, or electricity. Air compressors, hand drills; theory of blasting; method of putting in holes; explosives used in blasting; powder; nitro-glycerine; other high explosives; fulminates; directions for using and methods of firing; charging detonators; methods of firing blasts; ventilation; removal of stuff; substitutes for explosives; breaking ground by the action of water or fire; attack of ground; driving of drifts and tunnels; sinking and raising; sinking of shafts and slopes.

Supports. Timber; kinds of timber used for supporting excavations; dry rot; processes used for the preservation of timber; modes of timbering levels, shafts, winzes, slopes and other excavations: masonry and iron or steel supports for similar purposes; special methods of support in the case of watery and running strata;

compressed air, freezing and other processes; saving of timber resulting from the adoption of caving and filling methods.

Exploitation, or working away minerals. Open works. Hydraulic mining. Working of deposits and support of excavations; methods applicable to deposits of different thickness, inclination and character. Coal mining, vein mining, working of thick deposits and soft-ore bodies. Salt mining.

Transport, or conveyance along roads. Wheelbarrows, underground tram-cars, use of ponies or horses, mechanical haulage, locomotives for use underground, electric railways, conveyance of minerals above ground, wire rope-ways.

Winding, or hoisting in shafts or along inclines. Machinery and apparatus required. Buckets, boxes, kibbles, and cages; ropes of various descriptions; pit-head frames; guides or conductors; landing on banking; safety devices and signalling; arrangements for loading and unloading cars and vessels, and for storing minerals.

Drainage. Preventing access of surface water; adits or drainage tunnels; siphons; removal of water by winding machinery; pumping plant; dams.

Ventilation. Composition of air: gases met with underground; causes of the deterioration of air; dangers of dust; natural ventilation, its advantages; ventilation by furnaces; mechanical ventilators of various kinds; distribution of air through the workings; methods of testing the purity of the air; fire-damp detectors; methods of measuring and recording the volume of the air passing through the workings.

Lighting. Candles; lamps fed by tallow, and by animal, vegetable or mineral oils; safety lamps; gas and electric lamps; expense of lighting.

Descent and Ascent. Steps and slides; ladders; winding machinery; safety appliances; man engine.

Principles of Employment. Day wages; contract work by weight or measure; contracts in which men have an

interest in the value of the mineral extracted ; administration, organization and business management ; mine accounts.

Legislation. Special acts relating to mineral laws and the working of mines.

Accidents. Classification ; explanation of the commonest kind of accidents ; comparison of fatalities at different kinds of mines ; comparison of the miner's calling with certain other trades as regards liability to accidents.

Examination and Valuation of Mines.

Miscellaneous Considerations, such as the condition of workmen, surface plants, useful minerals in different parts of the globe, mining statistics, etc.

Ore Dressing. The lectures on this subject include the general principles and theory of ore dressing and the mechanical preparation of coal. Washing, packing, crushing and sizing ; concentration by various methods ; description of typical dressing works and coal-washing plants ; magnetic separators ; manufacture of patent fuel.

Milling. The milling of gold and silver ores will receive especial attention in connection with practical work in the mining laboratory. Physical and chemical properties of gold and of mercury, amalgam, rock-breakers, grizzlies, mortar box and its accessories, screens, dies, the stamp, tappet, stem, head, shoe, cam shaft, cams, cam curve, power, frame, guides, water supply, bins, general arrangement, ore feeders. Arrastra, Huntington Mill. Amalgamation, inside plates, copper tables, mercury wells, amalgam traps, loss of mercury ; riffles, blankets, bubbles, vanners, sizing, spitzkasten. Treatment of concentrates, amalgamation, chlorination, smelting, cyanidation : cleaning up, treatment of amalgam, cleaning, retorting and melting. Modes of treatment, cost of milling, general considerations. Sampling and assaying of ore, tailings, concentrates and bullion. Washoe process for silver ores ; the dry process for rebellious silver ores.

At the conclusion of the course there is an excursion lasting several days to some mining district.

The student who wishes to pass in mining should spend the summer vacations of his second and third years in actual practical work underground, so as to have a general knowledge of the subject before attending the lectures. At the commencement of the mining course, each student should furnish a statement showing what practical work he has done at mines. This statement should be signed by the managers of the mines at which he has worked.

In the final examination in mining, regard will be had to the proficiency of the student in assaying and in surveying; no student can pass in mining unless he has qualified in these two subjects.

MINE SURVEYING.

Practical instruction is carried on in mine surveying, including the following subjects:

- i. The measurement of distances.
- ii. The miner's dial, and its application to surveying, both at the surface and underground.
- iii. The variation of the magnetic needle.
- iv. Surveying with the magnetic needle in the presence of iron.
- v. Surveying with the fixed needle.
- vi. The German dial.
- vii. The theodolite.
- viii. Traversing underground.
- ix. Surface surveys with the theodolite.
- x. Plotting surveys.
- xi. Calculation of acres.
- xii. Levelling.
- xiii. Connection of the underground and surface surveys.

Special attention is given to field work.

THE MINING LABORATORY AND ORE TESTING WORKS.

The School is now provided with a *mining laboratory* and experimental reduction works, which is furnished with a stamp mill, a concentrator, a sample grinder, rolls and other machines with which ores are treated at the mines ; also a reverberatory roasting furnace and a chlorination plant. In selecting these machines, local and provincial as well as general conditions have been kept in view. The machines are of sufficient size to operate upon large quantities of ore (a ton or two can be easily handled). To test the suitability of processes, by getting such tests made, costly mistakes may be avoided. The value of the mill in this respect has already been shown in several instances.

The mining laboratory is a distinctive feature of well-equipped mining schools. The various operations of crushing, stamping, grinding, amalgamating, concentrating, chlorinating, sampling, and assaying are, by its aid, studied in such a way as to give the student a lively appreciation of the difficulties to be overcome and the care necessary in these operations.

The plant of the mining laboratory will be added to as circumstances render additions advisable.

Text-books—C. Le Neve Foster's "Ore and Stone Mining." (Chas. Griffin & Co., (Ltd.), Exeter St., Strand, London.)

H. W. Hughes' "Coal Mining." (Chas. Griffin & Co., (Ltd.), Exeter St., Strand, London.)

Books for reference :

John Milne's "Miner's Hand-book." (Crosby, Lockwood & Son, London.)

M. C. Ihlseng's "Manual of Mining." (John Wiley & Son, 53 Tenth St., New York.)

H. Louis' "Hand-book of Gold Milling." (Macmillan & Co., London and New York.)

Arnold Lupton's "Mining." (Longmans, Green & Co., London.)

J. H. Merivale's "Notes and Formula for Mining Students." (Crosby, Lockwood & Son, London.)

MECHANISM.

Lecturer: N. F. Dupuis, M.A., F.R.S.C.

Workshop Instructors: Robert Lindsay and Geo. A. Wright.

The instruction in mechanism is both theoretical and practical, and is given by means of lectures and the study of the actions of models, and by construction of machines, or their parts, in the mechanical workshop.

The lectures include the subjects of wheels, screws, belts, etc. The resolution of motion, cranks, and eccentrics, levers, link-work, and joint movements. Conversion of reciprocating into rotatory motion and conversely. The teeth of wheels, trains of wheels and computations; aggregate movement and miscellaneous contrivances.

Special machines are considered in some detail; such as the clock, the steam engine, the steam pump, the lathe, the dynamo, and the motor, and various other and less important ones.

The teaching in the mechanical workshop consists of instruction in wood-working and in metal-working, in turning and in general workshop operations. Students will be required to make patterns in wood; and also to make models and parts of models in both wood and metal; and in each session the more advanced students will be set to work to construct in detail some prominent or important machine.

CIVIL ENGINEERING.

Professor: R. Carr Harris, C.E.

THIRD YEAR.

Elementary machines and moduli.

Work of an expanding gas or steam.

Hydraulic principles and hydraulic structures.

Hydraulic machines and motors.

Construction of reservoirs, flumes and aqueducts.

Masonwork specifications and construction of stone-works and of brickworks.

Principles of designing structures.

Construction of coffer dams and caissons and sinking foundations under water.

Nature, production, and use of materials of construction, building stones, limes, cements, mortars, wood-works.

Strength of materials.

Stresses on framed structures, bridges, and roofs.

Cross-sectioning for contours and cross-sectioning for quantities.

Estimating quantities of excavation and embankments and structures ; common roads.

Location and drainage and construction.

Tramways; curvature and gradients and trestle works.

Profile sections and plans.

Books for reference :

Dictionary of Engineering: Spon.

Civil Engineering : Rankine.

Treatise on Foundations: Paton.

Highway Construction: Bryne.

DRAWING.

Lecturer: Wm. Mason.

FIRST YEAR.

Drawing instruments and materials ; descriptive geometry ; projection ; tinting and lettering ; topographical drawing.

SECOND YEAR.

Machine drawing ; graphical statics ; designing.

Books for reference—Davidson's Linear Drawing and Projection ; Davidson's Practical Perspective ; Davidson's Drawing for Machinists ; Cryer & Jordan's Machine Construction and Mechanical Drawing ; Thorne's Mechanical Drawing ; MacCord's Mechanical Drawing.

In each year, attendance of at least eight hours a week is required.

SURVEYING.

Lecturer: Wm. Mason.

FIRST AND SECOND YEARS.

Plane, topographical, and railway surveying; calculations; maps and scales; topographical drawing; use and adjustment of surveying instruments; methods of surveying; field work.

THIRD AND FOURTH YEARS.

Plans, profiles and cross sections; estimates of quantities; methods of contracting and contract payments.
(See also under *Mining Engineering*.)

Books for reference—Gillespie's Land Surveying; Trautwine's Engineer's Pocket-Book; Reed's Topographical Drawing and Sketching.

The Classes in English, Mathematics, Physics and Animal Biology are taken in Queen's University.

ENGLISH.

Professor: James Cappon, M.A.

Tutor:

1. Practical course in Rhetoric and Composition.
 2. Lectures on style in connection with the study of passages from Bacon, Jeremy Taylor, Sir Thomas Browne, Addison, Johnson, Burke, Macaulay.
 3. A detailed study (in class) of the following works:
Chaucer, Prologue to Canterbury Tales.
Shakespeare, Julius Cæsar.
Carlyle, Essay on Burns.
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MATHEMATICS.

Professor: Nathan F. Dupuis, M.A., F.B.S., Edin.

Tutor: Geo. F. Metzler, Ph.D.

FIRST YEAR.

The theory and practice of Algebra to the binomial theorem inclusive. Dupuis' Algebra; the first thirteen chapters.

Geometry of the point line, and circle in the plane. Parts I. and II. of Dupuis' Synthetic Geometry.

Mondays, Wednesdays and Fridays, at 3 p.m.
(2nd term). Plane Trigonometry proceeding De Moivre's theorem—Problems and applications.

Tuesdays and Thursdays at 10 a.m.

SECOND YEAR.

(1st term). Synthetic Solid Geometry. (Dupuis').
(2nd term). Spherical Trigonometry.

Thursdays at 3 p.m.

Higher Algebra. (First course).

Tuesdays at 4 p.m.

THIRD YEAR.

Elementary Co-ordinate Geometry.

Mondays at 11 a.m.

Elementary Differential and Integral Calculus.

Thursdays at 11 a.m.

PHYSICS.

Professor: D. H. Marshall, M.A., F.R.S.E.

Tutor: W. C. Baker, M. A.

JUNIOR AND SENIOR CLASSES.

Lectures and Experiments are given in the following subjects :

Properties of Matter.

Extension—Inertia—Mass—Density—Gravitation—Specific weight—Weight of gases—Molecular forces—Energy.

Dynamics.

Kinematics—Statics of solids and fluids—Kinetics of solids and fluids.

Heat.

Thermometry—Calorimetry (Specific and Latent Heats)—Hygrometry—Transference of heat (Conduction and Radiation)—Dynamical theory of heat.

Light.

General laws of Radiant Energy—Geometrical Optics—Physical Optics—Construction and use of Optical Instruments—Spectrum analysis.

Acoustics.

Physical Theory of Music—Optical methods of studying vibratory motions.

Magnetism.

With special reference to terrestrial magnetism.

Electricity.

Frictional Electricity—Voltaic Electricity—Thermo-Electricity—Magneto-Electricity—Electro-Magnetism—Diamagnetism—Electro-Dynamics.

Algebra, Geometry and Trigonometry are applied to the solution of problems, and weekly exercises are given throughout the session.

Text-book—Marshall's *Introduction to the Science of Dynamics*, parts I. and II., (to be obtained from the Registrar, price \$1.00 for each part).

The following books should be used in connection with the lectures:

Deschanel's Natural Philosophy or Ganot's Physics.

Chambers' Mathematical Tables.

Junior Physics—Mondays, Wednesdays and Fridays, at 10 a.m.

Senior Physics—Tuesdays and Thursdays, at 10 a.m.

THIRD YEAR.

Optics.

Dupuis' Geometrical Optics or Aldis' Geometrical Optics.

ANIMAL BIOLOGY.

Professor: A. P. Knight, M.A., M.D.

Tutors: D. Cunningham, B.A., M.D.

W. Moffatt, M.A.

The course in this subject begins on the 1st of October and lasts to the end of January. Lectures will be given daily, 10 to 11 a.m. For laboratory work, the class will be divided into two sections, one of which will be taken on Thursdays, 10 to 12 m., and the other on Fridays, 10 to 12 m.

The lectures treat of protoplasm, cells, cell division, reproduction, early stages of development, tissues, organs,

differences between animals and plants, general view of invertebrata and of vertebrata.

The laboratory work consists of such dissections and demonstrations as will elucidate the subjects of the lectures. The lectures are illustrated by diagrams, charts, and lantern transparencies.

Text-book—Campbell's Introduction to the Study of Elementary Biology. (Macmillan & Co.)

PROSPECTORS' COURSE.

The School offers to mine foremen, assayers, prospectors, and mining men generally, special courses of instruction, beginning January 6th, 1897, and continuing for eight weeks, as follows :

1. CHEMISTRY.—A short course of lectures illustrated by experiments, introductory to the courses in mineralogy and assaying.—DR. GOODWIN.

2. MINERALOGY.—Lectures illustrated by specimens, dealing with the general principles of mineralogy, and accompanied by practice in identifying minerals by field tests.—PROF. NICOL.

3. GEOLOGY.—Lectures on the elements of geology, with illustrations from the geology of Ontario. *Ore Deposits* will claim special attention.—MR. MILLER.

4. LITHOLOGY.—The character and modes of occurrence of rocks generally—Examination of hand specimens—Special attention will be given to the crystalline rocks of Ontario, the more typical mineral-bearing rocks being well represented by specimens in the collection.—MR. MILLER.

5. DISCOVERY AND WINNING OF ORES.—This course will be of particular interest to mining men and prospectors, as it will deal with the application of the principles of chemistry, mechanics, mineralogy and geology to the discovery and winning of valuable minerals, and to the usual methods and machinery in vogue to open up the deposits and exploit and prepare the ore.—MR. HAMILTON MERRITT.

6. MILLING.—the class will have opportunities of learning in the *mining laboratory* the use of crushers, stamp mill, roasting furnace, chlorination apparatus, and other machinery.—MR. HAMILTON MERRITT.

7. BLOWPIPING.—A practical course intended to give facility in the use of the blowpipe for the identification of minerals.—PROF. NICOL.

8. ASSAYING.—Opportunities will be given for practice in furnace methods, particularly in the use of the portable assay furnace.—PROF. NICOL AND MR. BROCK.

9. DRAWING.—The elements of mechanical and free-hand drawing as applied to surveys of mining claims and mines, to mining plant, &c.—MR. MASON.

10.—ADVANCED WORK.—Those who are prepared for such work may attend (without charge) lectures on the *chemistry of fuels, ores, fluxes and furnaces*, and on *advanced mineralogy and geology*. Every facility will be given for work in the chemical, mineralogical, petrographical and assay laboratories.

FEES.—Every student must pay a registration fee of one dollar. For all the elementary courses (No. 1 to 8 inclusive) a fee of ten dollars will be charged; for any one of them two dollars. Fees for the use of the laboratories for advanced work will be in proportion to the number of hours a week; but not to exceed eight dollars.

OTHER EXPENSES.—Good board can be had in the city at from \$3.00 to \$4.00 a week. The other items of expense (for books, &c.,) need not be large.

The work is made thoroughly practical; and those who wish to enter upon it can do so with advantage, even though they may have had no previous scientific education.

EXTRAMURAL CLASSES FOR PROSPECTORS AND MINING MEN.

The School of Mining will send lecturers to mining centres to conduct classes in Elementary Chemistry, Mineralogy, and Geology as applied to the discovery and testing of economic minerals. Sets of apparatus and chemicals will be provided, and those attending these classes will have an opportunity of learning to use the blowpipe for the detection of minerals, and to make silver and gold assays with the blowpipe and with a portable furnace. For further particulars address

W.M. MASON,
Bursar School of Mining, Kingston.

SUMMER SCHOOL OF SCIENCE.

This school is conducted by members of the staff of the University and of the School of Mining and Agriculture. Its object is to assist teachers and others who cannot attend the University during the winter session in completing a University course in arts. Two or three subjects are to be taken up each session, their nature depending on the applications that may be made by candidates. For the session of 1896, the subjects will be Botany and Animal Biology, with particular reference to the practical part of the specialists' examinations in these subjects. Attention will be given to the preparation of microscope specimens suitable for class work in schools.

Classes will begin on Tuesday, July 7th, 1896, and continue in session for about four weeks.

The subjects for 1897 will probably include Chemistry, Mineralogy, and Geology.

Persons proposing to attend should apply to

W.M. MASON,
Bursar School of Mining.

FIELD CLASS IN GEOLOGY AND PROSPECTING.

SEPTEMBER, 1896.

The attention of students and others is called to the annual tour of three weeks for the practical study of geology and prospecting methods. The travelling will be done chiefly by canoes. The party will be supplied with tents and a camp outfit, and will leave Kingston on Tuesday, Sept 1st. Some of the chief mineral localities of the Kingston district will be visited, and abundant opportunities will be offered for collecting specimens and studying the modes of occurrence of substances of economic value. Each member will be expected to assist in all the work of the party, and will pay his share of the expenses, including board, etc., reckoned at about fifty cents a day. It is estimated that the total cost will not be more than twenty dollars for each person for a three weeks' trip.

Particulars concerning the personal outfit required by each man may be obtained from the Bursar.

The party will be limited to twenty, but circumstances may arise which will necessitate taking a smaller number.

A deposit of twenty-five dollars must be made with the Bursar by each member of the party, not later than Aug. 20th. At the end of the tour the unexpended part (less a tuition fee of three dollars), will be returned.

The party will be under the charge of MR. W. G. MILLER, of the School of Mining. Those who wish to join the party or who desire further particulars concerning the trip should apply to

Wm. MASON,

Bursar School of Mining, Kingston, Ont.

THE BRUCE CARRUTHERS SCHOLARSHIP.

The following are the conditions upon which this scholarship is to be awarded and held:

1. The candidate must have sufficient practical knowledge to run the milling machinery in the mining laboratory, viz.:—Crusher, rolls, stamp mill, true vanner, and sample grinder. It is particularly required that he be acquainted with amalgamating.

NOTE.—It would be practicable to attain this experience by spending a summer in a stamp mill assisting a good amalgamator.

2. The candidate must have entered upon, or be prepared to enter upon one of the courses of study as at page 9.

3. The scholar must run the machinery in the mining laboratory when required, must take care of the machinery, see that it is kept in good repair, and in general make himself useful as an assistant to the lecturer on mining engineering. It is understood that these duties are to be so arranged as to interfere as little as possible with the studies of the scholar.

4. The scholarship may be held for more than one session.

MINERAL AND GEOLOGICAL SPECIMENS.

It is desired to make the collections of this School as complete and representative as possible of the mineral resources of Canada. Specimens sent to the School will be named free of charge. Good specimens presented to the School will be labelled with the name of the donor and the locality, and will be preserved for reference.

Samples under 25 lbs. in weight may be sent by express; over that weight, by freight.

Specimens should be addressed to the Professor of Mineralogy, or to the Lecturer on Geology, School of Mining, Kingston, Ont.

DONATIONS OF MINERALS, MACHINERY, &c.

1. Minerals from the Ottawa and Bridgewater Districts. From Mr. D. Williams, P.L.S., Kingston, Ont.
 2. Graphite. From Mr. A. Barnett, Renfrew, Ont.
 3. White Mica from Old Chelsea, Ottawa Co., Que. From Mr. C. W. Chamberlin, Old Chelsea, Ottawa Co., Que.
 4. Copper Ores, Chrome Garnet, Millerite, Pyroxene, and Calcite. From Mr. John Blue, M.E., Superintendent Eustis Mining Co., Eustis, Que.
 5. Copper Ores. From Mr. Joseph Cousins, D.L.S., Sault Ste. Marie, Ont.
 6. Antimony Ore. From Mr. Gould Northup, Centre Rawdon, Hants, N.S.
 7. Articles manufactured from rock crystal, from Japan. From Mr. Toshi C. Ikehara.
 8. Group of Feldspar Crystals. From Mr. E. J. Cowan, Marmora, Ont.
 9. One Sergeant Rock Drill, complete. From the Ingersoll Rock Drill Co. of Canada, Montreal.
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DONATIONS OF BOOKS, &c.

1. Geological Survey of Canada Annual Report, Vol. VI., 1892-93; Reports (A) 1892, (A) 1893, (J.Q.R.S.) 1892-93; Annual Reports 1893 and 1894; Report (S) Vol. VII.; Maps Nos. 11, 379 to 390, 550, 551, Nova Scotia, Nos. 364 to 372, British Columbia, N.E. Quarter Sheet, Que., Rainy River Sheet, Ont. From Geological Survey Department of Canada.

2. Geological Atlas of the United States; 11 Folios; Annual Report 1892-93; Monographs xxiii and xxiv; Bulletins 118 to 122. From the United States Geological Survey Department, Washington, D.C.
3. Geological and Natural History Survey of Minnesota; Annual Reports for 1893 and 1894; Vol. III., part 1 of Final Report (Palaeontology). From Geological Survey Department of Minnesota.
4. Geological Survey of Missouri; Reports on Coal, 1891; Iron Ores, 1892; Mineral Waters, 1892; Lead and Zinc, Sec. 1 and 2 (2 copies); Palaeontology, parts 1 and 2 (2 copies); 3 Maps. From Geological Survey Department of Missouri.
5. Geological Survey of New Jersey, Annual Report for 1894; Report on Water Supply. From Geological Survey Department of New Jersey.
6. Transactions of American Institute of Mining Engineers (25 vols.). From American Institute of Mining Engineers, New York.
7. Annual Report for 1894. From Bureau of Mines, Toronto, Ontario.
8. Papers read before the Engineering Society of the School of Practical Science, Toronto; No. 8, 1894-5.
9. Proceedings and Transactions (second series) Vol. I., part 4. From Nova Scotia Institute of Science, Halifax, N.S.
10. Journal of General Mining Association, Province of Quebec, for 1894-5 (Vol. 2). From B. T. A. Bell, Sec., Ottawa.
11. Twenty-sixth Annual Report of State Board of Health, Massachusetts.
12. Bulletin No. 42 (Paris Green) of Laboratory of Inland Revenue, Ottawa.
13. Special International number of Iron and Coal Trade Review, London, Eng., 1895.
14. Rock Drills and Quarrying Machinery (pamphlet). From Ingersoll Rock Drill Co.
15. Map of Locations of Hematite and Magnetic Iron Ores in the Counties of Frontenac and Leeds, Ont. From Joseph Bawden, Esq., Barrister-at-law, Kingston, Ont.
16. Map of the Slocan Silver Camp, West Kootenay, B.C. From J. Keith Reid, Kootenay Mining Bureau, Montreal.
17. Photographs (4) of Hydraulic Mining at Lytton, Fraser River, and Quesnel River, B.C. From Dr. G. M. Dawson, Director of Geological Survey, Ottawa.

18. Photographs (12) from the Mesabi Mining District, Minnesota. From Mr. R. Bamforth, Kingston.
19. Engravings of Robb-Armstrong Engines (3) and Boiler (1). From Robb Engineering Co., (Ltd.), Amherst, N.S.
20. Magazines, &c.: "Canadian Engineer," Toronto; "The Province," Victoria, B.C.; "Mining Industry and Review," Denver, Col.; "North-west Mining Review," Spokane, Wash.; "Mining," Spokane, Wash.; "Iron Trade Review," Cleveland, O.; "The News," Rat Portage, Ont.
21. Calendars (20) of Universities, Colleges and Mining Schools.

SPECIMENS EXAMINED AND REPORTED ON FREE OF CHARGE.

1. E. J. Cowan, Marmora. Arsenopyrite, with gangue of calcite; may contain gold.
2. Warren & McCarthy, merchants, Perth. Yellow ferruginous clay from a well.
3. Louis Bedore, lot 20, 4th Con., Tp. Bedford, Frontenac Co. (Bobb's Lake), Tichborne P.O. Sample of hæmatite, apparently free from sulphur.
4. William Hewitt, Easton's Corners. Pyrite; a few crystals and broken masses; might contain gold. No commercial value.
5. Norman McInnes, Kearney P.O., Parry Sound. Decomposed garnetiferous gneiss and river gravel. No commercial value.
6. Thos. G. Albertson, Verona. Ferruginous quartz, containing schorl, but no "mineral."
7. Dr. Spankie, Wolfe Island. Sample of well water, containing excess of lime and chlorides, from well on Wolfe Island.
8. Dr. Spankie, Wolfe Island. Samples of granite, pyrite, mica, etc., examined for school teacher at Oso, Frontenac Co.
9. Mr. Cox, Reeve of Oso, and Mr. McDonald, of Mountain Grove, Olden. Samples of pyritic quartz and calcite; rock containing pyrrhotite and garnets.
10. Messrs. Carswell & Mackay, Calabogie. Three samples: Graphite in white granite; graphite, feldspar, quartz; molybdenite, sphene, etc.
11. Messrs. Carswell & Mackay, Calabogie. Two samples: Iron pyrites in quartz and columns of tourmaline; kaolin or changed feldspar.

12. Benjamin Botting, Lot 19, Con. 9, Bedford. Small fragments of pyrite, pyrrhotite and vesuvianite.
13. L. H. Burnham, Levant, Lanark. Quartz with small veins of titanic iron ore ; ilmenite.
14. A. Joyce, Calabogie. Small piece of tremolite ; fragments of asbestos (?), fibrous hornblende. Sample of tremolite and asbestos referred to H. W. Johns Co., 121 Federal st., Boston.
15. Paul Kingston, Hinchinbrooke. One-half ton calcitic rock ; interspersed pyrite.
16. James Carswell, Calabogie. Asbestos, referred to H. W. Johns Co., Boston ; tremolite, partly changed to talc ; foliated talc ; crystal of tremolite. No commercial value.

I. STUDENTS WHO HAVE PASSED EXAMINATIONS.

Junior Mathematics—S. N. Graham.

Trigonometry—H. S. Baker.

Synthetic Solid Geometry—H. S. Baker.

Conics—C. L. Fortescue.

Calculus—C. L. Fortescue.

Spherical Trigonometry—C. L. Fortescue, T. S. Scott.

Mechanism—H. S. Baker, T. S. Scott, C. L. Fortescue.

Scientific Instruments—H. S. Baker, T. S. Scott.

Junior English. Div. III.—S. N. Graham, H. C. Mabee.

Junior Chemistry. Div. II.—S. N. Graham.

Technical Chemistry. Div. I.—J. Donnelly, H. C. Mabee, M.

G. Spotswood.

Organic Chemistry. Div. III.—H. C. Mabee.

General Chemistry. Div. III.—H. C. Mabee.

Blowpipe Analysis. Div. II.—C. P. Merritt.

Second Year Geology and Petrography. Div. II.—H. C. Mabee.

Div. III.—J. Donnelly, M. G. Spotswood.

Economic Geology. Div. II.—M. G. Spotswood.

Descriptive Mineralogy. Div. III.—H. C. Mabee.

Determinative Mineralogy. Div. III.—M. G. Spotswood, J. Donnelly, H. C. Mabee.

Systematic Mineralogy. Div. III.—J. Donnelly, M. G. Spotswood.

Quantitative Analysis and Assaying. Div. II.—M. G. Spotswood.

Qualitative Analysis. Div. II.—M. G. Spotswood. Div. III.—J. Donnelly.

Engineering. Foundations and Designing of Bridges and Culverts.—T. S. Scott.

Drawing. First year, Div. I.—S. N. Graham, M. P. Cotton; Div. II.—C. P. Merritt. Second year, Div. I.—T. S. Scott; Div. II.—C. L. Fortescue.

Surveying. First year, Div. I.—S. N. Graham, H. C. Mabee; Div. II.—H. S. Baker, C. L. Fortescue; Div. III.—P. N. Nissen. Second year, Div. I.—M. G. Spotswood.

Mining (prelim.). Div. I.—J. Donnelly. Div. III.—M. G. Spotswood.

**II. STUDENTS TAKING SPECIAL COURSES IN PROSPECTING,
MINING, ASSAYING, &C.**

Chas. G. Rothwell, S. Davis, W. Traquair, T. McCamus, L. C. Newlands.

III. POST GRADUATE STUDENTS.

Reginald W. Brock, M.A., Fred. J. Pope, M.A.

IV. BRUCE CARRUTHERS SCHOLAR FOR 1896-97.

Horace C. Mabee, Port Rowan.

This scholarship will be awarded again May 1st, 1897, up to which date applications will be received. For conditions of award, etc., see page 40.

PART II.

THE DAIRY SCHOOL.

THE DAIRY SCHOOL.

LOCATION.

The Dairy School building is located almost in the centre of the city, and good board and lodging can be had in its vicinity at prices ranging from \$2.50 to \$3.00 per week. On reaching the city, students should take the street cars from the railway station and ask the conductor to let them off at the corner of Barrie and Union streets, near the school building.

THE BUILDING.

The building is a model cheese and butter factory combined. It was planned in part by Professor Dupuis, after visiting several model factories, and completed in its details by Professor Robertson, the Dominion Dairy Commissioner. The equipment includes a 20 horse power engine, Russian, Apha de Lavel and Alexandria separators, and the newest and most approved apparatus for cheese making, butter making, and milk testing.

LECTURES.

The lectures on the subjects taught are given in the building immediately adjoining the factory, and occur every morning at nine o'clock. These lectures are always subordinate to the main purpose of the school, which is to teach by demonstrations, and by requiring each student, in turn, to take part in the actual operation of making butter and cheese. From 10 A.M. to 5 P.M. is devoted to this practical work.

PAST SESSION.

The School was, last year, under the direction of Jas. W. Robertson, Dominion Dairy Commissioner.

The Staff of Instructors included J. A. Ruddick, superintendent and lecturer, and instructor in milk-testing; L. A. Zufelt, instructor in butter-making; G. G. Publow, instructor in cheese-making; Walter T. Connell, M.D., L.R.C.P.S. Eng., lecturer in bacteriology.

COURSES.

The ordinary courses provided practical instruction for two weeks in either cheese-making and milk-testing, or butter-making and milk-testing. In addition to the practical work, lectures were given on the following subjects: "Business Management," "The Composition of Milk," "Milk-testing," "The Preparation of Milk for Cheese-making," "The Principles of Cheese-making," "Practical Cheese-making," "The Separation of Cream from Milk," "Butter-making," "Creamery and Cheese Factory Machinery," "Care of Engine and Boiler," etc.

The ordinary courses began on the following dates:

1st	Course,	Tuesday,	December 10th,	1895.
2nd	"	Thursday,	January 2nd,	1896.
3rd	"	"	"	16th, 1896.
4th	"	"	"	30th, 1896.
5th	"	"	February 13th,	1896.
6th	"	"	"	27th, 1896.
7th	"	"	March 12th,	1896.
8th	"	"	"	26th, 1896.

The number and attendance at each ordinary course was limited to 30; 15 in the Cheese-making and Milk-testing Department, and 15 in the Butter-making and Milk-testing Department.

A special course in cheese-making began on February 13th and continued until March 26th. This course provided for a more advanced study of the art of cheese-making than was practicable in the ordinary courses. Besides the practical work of cheese-making and milk-testing each day, students were required to attend the lectures in the ordinary course and also a series of lectures on more advanced work. Some research work was conducted with and by the students; and a certain amount of reading was prescribed.

CONDITIONS OF ADMISSION AND FEES.

Any person over sixteen years of age who had worked at least one season in a butter or cheese factory was eligible for admission to the Ordinary Courses.

Admission to the Special Course in cheese-making was limited to those who had had at least two years' experience working in a cheese factory.

Each student was required to pay a registration fee of \$2.00, which entitled him to free tuition for four weeks, viz.: two Ordinary Courses in either cheese-making or butter-making, or one course in each. For each additional course or part of a course, a fee of \$1.00 was charged. Each student in the Special Course was charged \$1.00 in addition to the registration fee of \$2.00.

CERTIFICATES.

A certificate of attendance and application was granted to each student who (1) attended all the lectures during two ordinary courses or during the special course, (2) was not absent from the School during the hours of work without a reasonable excuse, and (3) showed a desire and capacity to profit by the instruction given.

DIPLOMAS.

Each student in the special course who passed a satisfactory examination at the end of the term and who will prove to be a careful and competent cheese-maker and manager, by successfully conducting a factory during one season, will thereafter be entitled to a diploma.

The Board of Governors opened a library and reading room in connection with the School last year, and this will be available for the use of students who attend next winter.

NEXT SESSION.

For the coming session, 1896-97, the Dairy School will be under the management of the Ontario Government or its Minister of Agriculture. The Government has put \$1,000 in the estimates for enlarging the building. The Board of Governors will continue to assist, and will offer advice from time to time regarding the extension of the agricultural side of the work contemplated by the school. On agreeing to hand over the School to the Government, the Board reserved to itself the power of

initiating any new departments which it might deem necessary.

The Board of Governors hope to have the School under a very efficient staff of instructors next winter. The exact dates of the opening of each course will be announced early in the autumn. Meanwhile applicants for admission may file their applications up to November, 1896, with Mr. William Mason, the Bursar, and after that time may send them direct to the Superintendent.

The School will open the second week in December, 1896, and close the first week in April, 1897.

STUDENTS IN ATTENDANCE.

The following are the names of the students who attended the School during the past session:

NAME AND P.O. ADDRESS.	NAME AND P.O. ADDRESS.
Armstrong, F. W., W'chester, Ont.	Graham, E. H., Miller's Co'rs, Ont.
Babcock, A. E., Wilton,	Greer, H. G., Brier Hill, N.Y.
Barker, Dan, Avonmore,	Guthrie, W., Perth Road, Ont.
Beamish, H. H., Carsonby,	Gillespie, F. S., Fenella,
Brown, F., Oxford Mills,	Hogle, P. W., Trenton,
Bates, H. J., Elbe Mills,	Howson, Ed., Cavan,
Buro, J., Mille Roches,	Kevill, C. F., Peterboro,
Boulton, T. E., Hawkesbury,	Kerr, S. W., Hallville,
Bishop, W., Zealand,	Knapp, J. E., Plum Hollcw.
Bean, A., Ca'gton Manor, N.W.T.	Kelly, D., Andrewsville,
Bulloch, John, Hopetown, Ont.	King, W.M.H., St. Sylvester, Que.
Card, C. W., Enterprise,	Kember, W. J., Rednersville, Ont.
Cleary, J. V., Harrison's Co'rs,	Lawson, S. G., St. Andrew's,
Clacker, D., Avonmore,	Livingston, R. H., Smith's F's,
Campbell, J.R., Renfrew,	Levesque, N., Ormond,
Caverly, S., Railton,	Lappin, W. J., Melcombe,
Cummings, T., Willetsholme,	Morris, S. E., McPhail,
Chenier, Z., Canaan,	Macpherson, J. A., Lancaster,
Duncan, J. R., McLaren's D't,	McEwan, N. A., Smith's Falls,
Davy, G. L., Murvale,	McRae, C. F., Avonmore,
Echlin, John, Carleton Place,	McMillan, N., Newington,
Ennis, D. C., Fallbrook,	McLeod, N., Moose Creek,
Fitch, U., Boonville, N.Y.	McMonagle, A. R., Berwick,
Ferguson, D., McLaren's D't, Ont.	McDonald, W., St. Lawrence,
Fetterly, D., Moulinette,	McKay, R. J., Maberly,
Falkner, W. J., Cassburn,	McGrath, W. J., Belleville,
Fair Geo., Watson's Corners,	McCann, J. D., Perth,
George, F. W., Kingston,	O'Keefe, D., Elgin,
Grant, H. S., Moose Creek,	Porter, Geo., Elginburgh,

NAME AND P.O. ADDRESS.	NAME AND P.O. ADDRESS.
Philp, T. W., Precious Corn's, Ont.	Thompson, Thos. H., Madoc, Ont.
Purvis, A. P., Maxville,	Throop, A., Algonquin,
Porteous, W. J., Ormond,	Towsley, C., Brockville,
Renwick, Geo., Selwyn,	Thompson, C. W., Cooper,
Reid, Fraser, Kingston,	Vance, Jas., Moose Creek,
Rancier, Geo., Portsmouth,	Van Horne, C., Erie,
Roberts, C., Burnley,	Vandewater, R., Centreville,
Redden, E., Portsmouth,	Wood, L. F., Sydenham,
Ready, Jas. A., Hopetown,	Warren, W., Peterboro,
Somerville, A. G., Middleville,	Welsh, Thos., Tamworth,
Stevens, W., Delta,	Whiting, H. D., Toledo,
Scott, R. W., Prescott,	Whyte, R., Watson's Corners,
Smith, C. H., Chantry,	White, J. T., Cardinal,
Singleton, W. M., Newboro,	Wickware, W., Cloyne,
Storie, R., Lochwinnoch,	Wall, F. B., St. Elmo,
Simpson, T. L., Carleton Place,	Wilder, L., Sandy Creek, N.Y.
Terwilligar, J. R., M'ntain V'w,	

Attendance by counties with the number of factories in each county represented :

COUNTY,	NO. OF STUDENTS.	NO. OF FACTORIES.
Lanark.....	15	39
Frontenac.....	14	54
Stormont	12	33
Leeds.....	11	76
Hastings.	4	87
Grenville	4	40
Dundas.	4	36
Lennox & Addington	4	26
Peterboro.....	3	35
Glengarry	3	47
Northumberland.....	3	36
Prescott...	2	52
Prince Edward.	2	22
Renfrew.....	2	14
Russell	1	26
Durham.....	1	13
Carleton.....	1	36
Totals...	86	672
New York State	3	
North-West Territories.	1	
Quebec	1	.

Names of students who completed the special course in cheese-making :

Geo. Porter, Elginburg, Ont.	H. H. Beamish, Carsonby, Ont.
A. E. Babcock, Wilton, "	G. L. Davy, Murvale, "
Thos. Welsh, Tamworth, "	T. E. Boulton, Hawesbury, "
S. G. Lawson, St. Andrew's, Ont.	D. O'Keefe, Elgin, "
R. H. Livingston, Smith's Falls, "	R. W. Vandewater, Centreville, "
U. Fitch, Boonville, N.Y.	D. C. Ennis, Fallbrook, "
H. D. Whiting, Toledo, Ont.	W. M. Singleton, Newboro, "
Johiel Buro, Mille Roches, Ont.	D. Kelly, Andrewsville, "

Summary of attendance :

130 Applications were received.

119 Applications were accepted.

91 Students attended the School.

13 attended who took one course or more last session.

3 Students remained 14 weeks.

1 Student " 12 "

1 " " 10 "

3 Students " 8 "

11 " " 6 "

10 " " 4 "

62 " " less than 4 weeks.

Names of students who remained at the School four weeks and over and who were given certificates of attendance :

John R. Campbell, Renfrew, Ont.	R. H. Livingston, Smith's Falls, Ont.
Neil McLeod, Moose Creek, "	U. Fitch, Boonville, N.Y.
Chas. W. Card, Enterprise, "	H. D. Whiting, Toledo, Ont.
Jos. Terwilligar, Mountain View, "	Johiel Buro, Mille Roches, "
J. R. Duncan, McLaren's Depot, "	H. H. Beamish, Carsonby, "
H. S. Grant, Moose Creek, "	G. L. Davy, Murvale, "
Chas. VanHorne, Eric, "	T. E. Boulton, Hawkesbury, "
T. L. Simpson, Carleton Place, "	D. O'Keefe, Elgin, "
Freeman Brown, Oxford Mills, "	R. W. Vandewater, Centreville, "
Geo. Rancier, Portsmouth, "	D. C. Ennis, Fallbrook, "
Geo. Porter, Elginburgh, "	W. M. Singleton, Newboro, "
A. E. Babcock, Wilton, "	D. Kelly, Andrewsville, "
Thos. Welsh, Tamworth, "	Jno. A. Macpherson, Lancaster, "
S. G. Lawson, St. Andrew's, "	

PART III.

THE VETERINARY SCHOOL.

THE VETERINARY SCHOOL.

OPENS 13TH OCTOBER, 1896; CLOSES MARCH 21ST, 1897.

The object in establishing this department of the School of Mining and Agriculture is twofold: (1) to give to students such a knowledge of the diseases of domestic animals as will enable its graduates to practice the profession of Veterinary Surgeons, and (2) to give to farmers' sons and stock raisers such an elementary knowledge of Veterinary Science as will enable them to treat their stock intelligently, breed them scientifically, and in case of serious sickness administer temporary relief until a regularly qualified Veterinary Surgeon can be sent for.

In trying to accomplish these objects, the teaching staff will endeavor to lay a broad foundation by imparting as thorough a knowledge as possible of comparative anatomy, physiology and pathology. The latter subject will receive special attention because some contagious diseases are common to man and to the domestic animals, and other diseases which are not contagious, but caused by an animal's surroundings, develop the same symptoms and run the same course in the lower animals as in man.

BUILDING.

The building in which the didactic lectures on veterinary anatomy and diseases of animals will be delivered, stands at the corner of Barrie and Clergy streets and, with the grounds, is the gift of the city to the School of Mining and Agriculture. The property was valued at \$20,000. The main building consists of ample class rooms, a waiting room and reading room.

VETERINARY STAFF OF INSTRUCTORS.

GEO. W. BELL, V.S., V.D., Professor of Diseases of the Domestic Animals and Superintendent of Infirmary.
W. NICHOL, V.S., Professor of Veterinary Anatomy.
W. J. MORGAN, V.S., Professor of Practical Anatomy.
JNO. A. BELL, V.S., Government Veterinary Inspector, Watertown, New York, lecturer on contagious diseases of cattle, sheep and swine.

UNIVERSITY STAFF.

Students receive instruction from the following professors in Queen's University in the subjects named:

W.M. L. GOODWIN, B.Sc., (Lond.), D.Sc. (Edin.), F.R.C.S., Professor of Chemistry School of Mining and Agriculture.

JOHN HERALD, M.A., M.D., Professor of Materia Medica and Therapeutics.

A. P. KNIGHT, M.A., M.D., Professor of Animal Physiology.

W. T. CONNELL, M.D., F.R.C.S., Eng., Professor of Pathology.

ANNOUNCEMENTS.

All students are required to register at the beginning of each session.

Students are admitted and allowed to go on with their professional studies without being subjected to any examination in general knowledge, but *before presenting themselves for the first professional examination* they will be required to undergo an examination on the following subjects :

1. Reading.
2. Arithmetic, the Simple Rules and Fractions.
3. Ability to write a letter or essay on a given subject.
4. Elementary English History and Canadian Geography.

Candidates for admission who present certificates of having passed any of the examinations of the Education Department of Ontario, or any College or University examination, or a certificate from a public school inspector or teacher of having passed the promotion examination of the 4th class of a public school, will be exempt from the above examination.

The authorities of the school retain the right of refusing to admit any intending student whose character will not bear investigation, and of refusing to re-admit any student who during the previous session has not conducted himself to their satisfaction.

FEES.

First Session, Tuition Fee, including Matriculation and dissecting material.....	\$50 00
Second Session, Tuition Fee, including dissecting material	60 00
Degree of V.S	10 00

Attendance for a third session or part of a session, \$30.00.

All fees are payable in advance, and must be paid by the students personally as they enrol, or be directly remitted by their parents or guardians to the Bursar, Wm. Mason, Esq.

Board can be obtained at from \$2.50 to \$3.50 per week.

Occasional students are not required to undergo any examinations. They will be allowed to attend any one class on payment of a fee of \$12.00 per session.

Students are required to take the junior chemistry class in the School of Mining. The lectures are given in the John Carruthers Science Hall, near the University buildings. The lectures in animal biology and physiology, materia medica and therapeutics, histology and pathology are the same as those for students in medicine, and are delivered in the medical building of the University at the hours specified in the time table.

The infirmary for sick animals and the dissecting room for instruction and study in practical anatomy are under the direction of Professor Bell and are located near his residence at the head of Princess street.

COURSE OF STUDY.

The period of study extends over two winter sessions and includes a full course of lectures and demonstrations on the following subjects : Anatomy, chemistry, animal biology, including physiology, materia medica and therapeutics, normal and pathological histology, diseases of domestic animals, including veterinary dentistry and comparative pathology.

Students must attend at least 75 per cent. of the lectures on these subjects during both sessions.

Practical anatomy will be taught daily in the dissecting room under the superintendence of the professors or demonstrators. A certificate, stating the amount of dissecting done, will be given to each student at the close of the session, and no student will be allowed to present himself for his second professional examination until he has dissected the horse's body at least once.

All students during their course will be required to discharge in turn the duties of dressers, prosecutors, dispensers and visitors.

SHORT COURSE.

Beginning January 7th, 1897, there will be a short course of eight weeks' instruction and practice for farmers' and stock raisers' sons. The course will also be extremely useful to blacksmiths who desire to learn how to shoe a horse properly, by first learning the anatomy of the horse's foot. It will include instruction in veterinary anatomy, and simple treatment of diseases of the domestic animals. Other classes may be taken with the permission of the faculty; but intending students are advised to limit their studies to the anatomy and diseases of animals. The fee for this short course will be \$20.00.

A certificate will be given to those who attend this course and pass a satisfactory examination.

SPRING AND SUMMER SESSION.

At the end of each winter session there shall be an extra course of instruction (open to second year students), extending from April to June, and devoted specially to clinical medicine, clinical surgery and particularly to dentistry. This latter branch of veterinary science has become very important in recent years, and Dr. Bell has devoted much time to its study and practice.

The fee to be paid for this course by students of this department of the school will be \$25.00, but attendance is entirely optional and not necessary for graduation. The fee to students and graduates of other veterinary colleges will be \$40.00.

PROFESSIONAL EXAMINATIONS.

Before being awarded the degree in veterinary science a student must pass two professional examinations, one at the end of the first session and one at the end of the second.

The subjects of the first professional examination shall be *materia medica*, anatomy (the bones and ligaments of the common domesticated animals), animal biology and junior chemistry.

The subjects of the second professional examination are anatomy, junior physiology, *materia medica* and therapeutics, diseases of domestic animals and pathology.

Graduates or undergraduates in arts, science or medicine of any university in Canada or the United States, and graduates or undergraduates of a college of pharmacy, dentistry or agriculture, who have attended courses of lectures and passed examinations equivalent to those required by the curriculum of this school, will be allowed to graduate on completing the curriculum, paying the required class fees and passing the final examination.

VETERINARY PRACTICE.

The lectures have been so arranged as to allow ample time for practical work under the direction of the veterinary staff, such as patient visiting, clinical instruction, examination of horses as to soundness, surgical operations, post mortem examinations, practical examination of feet for lameness, etc.

The veterinary practice in connection with the school infirmary for sick animals, and in connection with the private practice of the professors, will be such as to afford ample opportunities for students to obtain a good practical knowledge of their profession.

All the medicines used in the practice of the infirmary will be compounded by the students under the direction of the professors. They are required to practice during the summer vacation under the supervision of a qualified practitioner.

Students will be allowed to visit the museum of the medical faculty of Queen's University, and may borrow books from the university library under the usual university regulations.

For further particulars apply to the bursar, William Mason, School of Mining and Agriculture, or to Dr. G. W. Bell, Professor of Diseases of Domestic Animals, Kingston, Ont.

VALUE OF THE SCIENCE.

The progress of veterinary medicine, surgery and dentistry in Canada and the United States has not kept pace with the advances in other branches of science, and especially with human medicine. The public have been brought to feel strongly the want of men educated in veterinary medicine, because of the ravages lately of contagious diseases, such as epizootic, glanders, pleuro-pneumonia, texan-fever, anthrax, swine-plague, chicken-cholera, etc. The estimated loss in the United States from pleuro-pneumonia alone of more than \$10,000,000 within ten years, shows the great importance of a correct knowledge of such diseases. The various general diseases to which our domestic animals are continually subject are of no less importance than the contagious diseases.

The great advances made in knowledge of the etiology of the contagious diseases of man, and their intimate relation to the contagious diseases in animals, open a large and fruitful field for investigation, the importance of which can scarcely be overestimated. It has been shown already that several of the diseases of man are transmitted to him from the lower animals, and it seems probable that the same relations exist with regard to many others. It is to the veterinarians that science looks for the elucidation of these problems. There is a large and increasing public demand for intelligent scientific inspection of meat and milk and examination of milch-cows. Thus the field of labor for the veterinarian is a large and lucrative one, and its scope is constantly increasing. The time is not far distant when every city of ten thousand population will have a veterinary inspector of meats offered for food.

It was tuberculosis and pleuro-pneumonia that deterred American cattle from being shipped to France and Germany in the last year. This latter point alone creates a large field for veterinary inspectors at every port of entry.

The post-graduate work commences about April 5th, or after the veterinary examination is over, and is for the purpose of giving graduates special instruction in clinical medicine, surgery, and veterinary dentistry, the latter of which is becoming very profitable and popular, especially in the United States. This special branch is given at the time of year best adapted for operations, and when clinical obstetrical cases in mares and cows are most numerous. Graduates will have the opportunity of seeing all operations, such as spaying mares, cows, bitches, etc., castration in all its branches, including the castration of ridgling horses, also the operation for roaring or wind-broken horses, string-halt or spasmodic jerking of the hind limb, and other operations too numerous to mention, such as the Cæsarian operation, etc. These operations are all performed under anæsthetics, either local or inhalation, as the case may require. At the same time, every graduate shall have the privilege of not only seeing but performing all the operations that come under veterinary surgery and dentistry under the instruction of the best Canadian and American skill.

TEXT-BOOKS RECOMMENDED.

Students are advised not to buy text-books till after consultation with the professor who teaches the subject.

Anatomy.—Strangeway's Veterinary Anatomy.

Physiology.—Foster & Shore's Elementary Physiology.

Histology.—Sterling's.

Chemistry.—Goodwin's.

Medicine and Surgery.—Williams' Principles and Practice of Veterinary Medicine; Williams' Surgery; Fleming's Veterinary Obstetrics.

Materia Medica.—Dunn's Veterinary Medicines; Walley's Veterinary Conspectus.

Cattle Diseases.—Steel's Bovine Pathology; Carter's Cattle Doctor.

Diseases of the Dog.—Hill.

Entozoa.—Payne ; Green.

Dictionary.—Gould's Medical Dictionary.

Biology.—Dr. Campbell's Introduction to Elementary Biology (Macmillan & Co.)

REGISTRY OF STUDENTS.

The following students registered in the Department of Veterinary Science during the session :

M. Gallivan, Kingston.

W. D. Garratt, Prince Edward.

W. Rowsen, County of Frontenac.

W. Northmore, Cataraqui.

R. Haffner, Kingston.

M. Branigan, Kingston.

R. Leasin, Watertown, N.Y.

FIRST YEAR TIME TABLE.

9-10.	Monday, Anatomy.	Tuesday, Anatomy.	Wednesday, Anatomy.	Thursday, Anatomy.	Friday, Anatomy.
10-11.	Animal Biology and Physiology.				
11-12.	Jr. Chemistry.	Jr. Chemistry.	Practical Chemistry.	Practical Biology.	Practical Biology.
1 to 3.30	Practical Anatomy.		Practical Anatomy.	Practical Anatomy.	Practical Anatomy.
4-5.	Materia Medica.	Materia Medica.	Materia Medica.	Materia Medica.	Materia Medica.
5-6.	Diseases of Animals.		Diseases of Animals.	Diseases of Animals.	Diseases of Animals.

APPENDIX.

Reports and Financial Statements

**REPORT OF THE KINGSTON SCHOOL OF MINING
AND AGRICULTURE.**

ADOPTED AT THE ANNUAL MEETING, APRIL 17, 1896.

The Governors report with pleasure that the various departments of the School have been conducted with success during the past year. In addition to the ordinary work of the Mining School, the mining laboratory, and the outside prospectors' classes, a field course in prospecting was organized in September, which was found so profitable that arrangements are being made for conducting another this year. The Government of the Province has decided to undertake in future the full charge of the Dairy School, and has put \$1,000 in the estimates for enlarging the building. The Board of Governors will continue to assist, and will offer advice from time to time regarding the extension of the agricultural side of the work contemplated by the School. They have reserved to themselves the power of initiating new departments which they may deem necessary, if these should not be undertaken by the Government. It is a matter of gratification to the Board that a Minister who has shown so great an interest in the agricultural development of the Province as the Hon. Mr. Dryden has for many years, and who has done so much to make the college at Guelph a success, should have assumed the responsibility of this department. This is a pledge to the public that it will be conducted with a view to the benefit of the whole of Eastern Ontario. They desire also to acknowledge cordially the assistance received in the past from the Dominion Ministers who have had charge of the portfolio of Agriculture, especially from Professor Robertson acting on their behalf. They cherish the confidence that similar assistance—whenever it is required by our agricultural, horticultural, or other great natural industries—will be again extended to the Board in its efforts to develop this section of the Dominion.

The Governors are glad to report that a Veterinary department has been opened during the past year in

connection with the Agricultural side of the School. Arrangements had been made for the arrival, last summer, of Dr. Bell, the gentleman entrusted with the organizing of this department, but as he found it impossible to arrive before October, the veterinary course opened with a small class, but there is every prospect of a steady increase in numbers. Excellent facilities are provided not only for instruction but for laboratory and clinical work.

We append reports from the various departments of work connected with the School, and statement of receipts and disbursements for the year.

(Signed) A. P. KNIGHT,
Secretary of the Board.

TREASURER'S REPORT.

SUMMER SCHOOL.

During the months of July and August a Summer School, for the special benefit of teachers, was held. Seventeen took advantage of the courses in Practical Chemistry, Chemical Analysis, Mineralogy, Crystallography, and Assaying.

FIELD PROSPECTING.

In September a field course in Prospecting was organized, with the object of making the instruction in prospecting methods thoroughly practicable. This was the first course of the kind given in Canada. The class was limited to twelve.

The expedition left Kingston with canoes and camp outfit per K. & P. RR. on September 3rd. The canoes were launched in the Mississippi River at Snow Road station, and the party spent the next two weeks examining the mineral resources of the townships of Palmerston, Clarendon and Barrie. Samples of ore from a number of "prospects" in these townships had been treated at the stamp mill of the School and it was interesting for the members of the party to see the modes of occurrence of these. A large number of specimens were collected and are now on exhibition at the School. No systematic

geological examination of this district has been made for over twenty years, although promising indications of the occurrence of gold and other metals have been found at a number of localities. The Frontenac County Council have expressed the wish that a similar expedition be undertaken next autumn.

After spending two weeks in this quarter the party spent ten days in the district to the east of the K. & P. R.R., canoeing through Bobb's Lake and Tay River to Perth, thence through the Tay and Rideau Canals to Kingston. In this district numerous iron, phosphate, mica and other deposits were examined and specimens were collected for exhibition in the museum of the School. Some interesting rocks—one of which contains a considerable percentage of nickel—not hitherto reported from this part of Ontario, were discovered. The members of the staff are now engaged working up some of the material collected with a view to publishing a report on the resources of the district.

During the expedition each member of the party made a valuable collection of minerals and gained experience not only in field geology but in what is not less valuable for the mineral hunter, rough prospecting methods, such as portaging, canoeing and wood-craft.

The canoes and camp outfit were supplied by the School. Each member was charged for his share of the incidental expenditure of the party, the total cost per man being \$11.98.

WINTER SESSION.

On October 1st, the third regular session of the School opened. The total number of students enrolled for the first term of the session is 163, showing an increase of 30 over this time last year.

STAMP MILL.

The Mining Laboratory or Stamp Mill has proved of great practical value to the Province. In all, thirteen lots of ore, varying in weight from 200 pounds to 6,000 pounds, have been run through, sampled and assayed.

In each case the concentrates, tailings and slimes were also sampled and assayed. The following is the list:—

	WEIGHT OF ORE.
1. J. H. West, Yarker	600 lbs.
2. E. S. Edmondson, Oshawa, (crushed, sampled and assayed only).....	200 "
3. Caladar Ore.....	6,000 "
4. Bonanza Gold Mining Co., Wahnapitae.....	4,000 "
5. " " " "	4,000 "
6. J. McGowan, Parry Sound.....	2,162 "
7. H. Roberts, Sharbot Lake.....	2,003 "
8. James Stark, Clarendon Tp., Frontenac County...	2,050 "
9. T. J. Hempton. Sharbot Lake	1,000 "
10. Crystal Gold Mining Co., Rathbun, Nipissing.....	1,990 "
11. Regina Gold Mine, Rainy Lake.....	1,970 "
12. Mr. McDonald, Mountain Grove, Olden.....	2,000 "
13. Damon Youmans, Mountain Grove, Frontenac Co.	2,000 "

OUTSIDE CLASSES FOR PROSPECTORS.

Thanks to the liberality of the Government and Legislature in providing \$1,000 for this work, classes were held, between July and December, in five important mining centres, as described in the report of Mr. William Hamilton Merritt, M.E. The Board has received from four of these places requests to urge on the Government the importance of continuing the work and of providing at each place a cabinet of typical minerals for economic and educational purposes. Such cabinets would cost little, and once properly arranged, local effort would be largely enlisted in adding to them. The Board respectfully commends this proposal to the consideration of the Government.

WORK IN EQUIPPING THE MINING SCHOOL AND STAMP MILL.

The Government and Legislature provided \$4,070 for this purpose, and the work was carried on during the summer, under the personal supervision of the staff. The laboratories are now in excellent condition, and only a small supplementary grant is needed to complete the equipment of the Stamp Mill and the Petrographical Museum. A roasting furnace chlorination plant is required for tests on refractory gold ores and for treating the concentrates from free milling ores; also an electric

motor to run the Frue Vanner and chlorination barrel. Experience has shown that the Vanner does not do its best work when run from the same shaft as the rest of the machinery. It requires uniform speed.

All which is respectfully submitted.

(Signed) GEO. V. CHOWN,
Treasurer.

**STATEMENT OF REVENUE AND EXPENDITURE FOR
THE YEAR 1895-96.**

REVENUE.

Ontario Government, Maintenance Mining School	\$5,000 00
" " Special " "	4,070 00
" " Maintenance Dairy School.....	1,000 00
" " Special " "	2,300 00
" " Prospectors' Classes.....	1,000 00
Subscriptions paid since April 1st, 1895.....	2,385 00
" previously reported.....	720 00
Fees Summer School.....	109 00
" Mining School.....	2,490 25
" Dairy School.....	212 50
" Veterinary College.....	215 00
" Mining Laboratory.....	287 00
W. B. Carruthers, Scholarship.....	200 00
	<hr/>
	\$19,988 85

EXPENDITURE.

Amount overexpended 1894-95.....	\$2,069 51
Salaries.	6,512 36
Rent.....	1,250 00
Expenses Mining School.....	1,008 80
Apparatus Mining School.....	1,444 73
Summer School..	135 70
Dairy School.....	793 72
Equipment Laboratory No. 3, Mining School.....	875 75
Petrographical Laboratory and Museum.....	1,530 84
Prospectors' Classes.....	950 79
Scholarship.....	200 00
Equipment Mining Laboratory.....	276 62
Chlorination Plant, Mining Laboratory.....	200 00
Expense Mining Laboratory.....	575 55
Veterinary College.....	365 34
Amount to Capital Account.....	1,565 88
Cash on hand	233 26
	<hr/>
	\$19,988 85

Examined and found correct.

J. E. CLARK, Auditor.

SUBSCRIPTIONS PAID.

APRIL 1st, 1895, to MARCH 31st, 1896.

E. W. Rathbun, Deseronto	\$100 00
H. A. Calvin, Kingston	100 00
Wm. Harty, Kingston.....	100 00
Ellen M. Nickle, Kingston.....	100 00
James S. Hayden, Toronto	50 00
W. B. Carruthers, Kingston.....	30 00
Sandford Fleming, Ottawa.....	200 00
B. W. Robertson, Kingston.....	25 00
J. L. Whiting, Kingston.....	10 00
Geo. Y. Chown, Kingston.....	10 00
B. M. Britton, Kingston.....	10 00
Donald McIntyre, Kingston	10 00
G. M. Macdonnell, Kingston.....	10 00
Clark W. Wright, Kingston	20 00
Mills & Cunningham, Kingston.....	10 00
S. Anglin & Co., Kingston	10 00
J. B. McIver, Kingston	20 00
Thos. H. Johns, Kingston.....	10 00
L. W. Shannon, Ottawa.....	20 00
A. F. Chown, Kingston.....	10 00
Oliver Chown, Kingston.....	10 00
J. McNee Richmond, Kingston.....	20 00
Mrs. J. F. Dennistoun, Peterboro.....	10 00
R. Max Dennistoun, Peterboro.....	10 00
J. B. Williams, Peterboro.....	10 00
W. E. Roxburgh, Norwood.....	10 00
McKelvey & Birch, Kingston.....	20 00
McVety & Wood, Kingston	40 00
R. W. Waldron, Kingston.....	40 00
Thos. Ritchie, Belleville,.....	25 00
D. B. MacLennan, Cornwall.....	50 00
R. Campbell, Renfrew.....	10 00
W. G. Mills, Renfrew.....	20 00
Jas. Carswell, Renfrew.....	50 00
Jas. Russell, Renfrew.....	25 00
D. W. Stewart, Renfrew	10 00
Geo. Gillies, Gananoque.....	100 00
Alex. McLaren, Buckingham	50 00
John McLaren, Brockville	100 00
Jas. Wylie, Almonte.....	25 00
James Dingwell, Cornwall.....	25 00
Wm. Russell, Arnprior.....	10 00
Andrew Irving, Pembroke,.....	10 00
J. Rayside, Lancaster.....	10 00
The Gillies Bros. Co., Ltd., Braeside.....	100 00
J. B. Carruthers, Kingston.....	200 00
A. G. Farrell, Smith's Falls	20 00

J. R. Lavell, Smith's Falls.....	\$ 20 00
T. B. Caldwell, Lanark.....	25 00
J. R. Armour, Perth.....	100 00
Mrs. R. J. Craig, Deseronto.....	40 00
F. S. Rathbun, Deseronto.....	50 00
J. Miller, Toronto.....	60 00
M. Leggatt, Hamilton.....	175 00
John Mackie, Kingston.....	10 00
G. M. Milligan, Toronto.....	10 00
E. J. B. Pense, Kingston.....	20 00
J. B. Murphy, Kingston.....	10 00

	\$2,385 00
Subscriptions previously reported.....	720 00

	\$3,105 00

Examined and found correct.

J. E. CLARK, Auditor.

DATE DUE

A fine of five cents will be charged for each
day overdue.

